REMARKS

Initially, in the Office Action dated March 29, 2004, the Examiner has rejected claims 1-36 under 35 U.S.C. §112, second paragraph. Claims 1-36 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Sano et al. in view of U.S. Patent No. 6,493,395 (Isaksson et al.) in view of U.S. Patent No. 6,687,315 (Keevill et al.).

By the present response, Applicant has canceled claims 3-5, 8-13, 16, 18, 21-25, 28, 29 and 31-36 without disclaimer. Applicant has amended claims 1, 2, 6, 7, 14, 15, 17, 19, 20, 26, 27 and 30 to further clarify the invention. Claims 1, 2, 6, 7, 14, 15, 17, 19, 20, 26, 27 and 30 remain pending in the present application.

35 U.S.C. §112 Rejections

Claims 1-36 have been rejected under 35 U.S.C. §112, second paragraph. Applicant has amended the claims to further clarify the invention and respectfully requests that these rejections be withdrawn.

35 U.S.C. §103 Rejections

Claims 1-36 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Sato et al. in view of Isaksson et al. and Keevill et al. Applicant respectfully traverses these rejections.

Sato et al. discloses a receiver for an OFDM modulated transmission signal including at least one synchronizing symbol in each frame, the synchronizing symbol is located by stepwise shifting a window along a reception sample sequence to make a cross-correlation calculator calculate cross-correlation values between a stored

pattern produced from a pattern memory and sequence portions picked up by the window, a maximum selector select two successive maxima of the cross-correlation values at a time interval substantially equal to a frame period, and a controllable clock generator generate a clock sequence at the time interval for use in sampling the sample sequence. On a transmitter side, the at least one synchronizing symbol may either be preceded by a null period or be a main synchronizing symbol preceded by an auxiliary synchronizing symbol for use in roughly defining ranges in which the window should be shifted.

Isaksson et al. discloses a multi-carrier transmission system using orthogonal carriers with high order QAM constellations for the transmission of multiple bits per carrier and symbol. Such systems place high demands on the synchronization of the receiver with the transmitter. The maximum permitted deviation from exact synchronization is usually a small fraction of a sampling interval. A reserve carrier, the pilot carrier, which is given a fixed phase is usually used as the reference to achieve this high accuracy. The receiver sampling clock oscillator is phase locked to the pilot carrier. It is therefore necessary to estimate the phase of the pilot carrier. Using a bandpass filter to recover the pilot carrier, regardless of the frame structure of the DMT signal, does not eliminate the influence of neighboring carriers on the pilot carrier.

Keevill et al. discloses a single chip implementation of a digital receiver for multicarrier signals that are transmitted by orthogonal frequency division multiplexing. Improved channel estimation and correction circuitry are provided.

The receiver has highly accurate sampling rate control and frequency control circuitry. BCH decoding of tps data carriers is achieved with minimal resources with an arrangement that includes a small Galois field multiplier. An improved FFT window synchronization circuit is coupled to the resampling circuit for locating the boundary of the guard interval transmitted with the active frame of the signal. A real-time pipelined FFT processor is operationally associated with the FFT window synchronization circuit and operates with reduced memory requirements.

Regarding claims 1, 14 and 26, Applicant submits that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of each of these claims of, inter alia, an interference discrimination unit coupled with a correlation arithmetic operation unit for detecting which peak is a less inter-symbol interference in the cross-correlation peaks obtained from the principle wave and the reflected wave. The Examiner admits that Sato et al. does not disclose or suggest inter-symbol interference or reflector wave being received from predetermined symbols and a peak detector, but asserts that Isaksson et al. and Keevill et al. disclose these limitations in various portions of their disclosures. However, Isaksson et al. merely discloses a technology relating to a "multi-carrier transmission system using orthogonal carriers with high order QAM constellations for the transmission of multiple bits per carrier and symbol" (see Abstract). In contrast, the limitations in the claims of the present application relate to an orthogonal frequency division multiplexed signal (OFDM), which is completely different from the QAM disclosed in Isaksson et al. In QAM, a plurality of

carriers are used for transmission in an I axis (axis of in-phase component) - Q axis (component axis orthogonal to I axis coordinates). In contrast, the limitations in the claims of the present application relate to transmission of an OFDM signal (see e.g., Figs. 2 and 3). OFDM and QAM are two completely different technologies.

Moreover, Keevill et al. merely discloses an improved method and apparatus for synchronizing a received data symbol with an FFT window in signals transmitted according to COFDM (see col. 4, lines 29-32), and that an FFT window synchronization circuit is coupled to the resampling circuit for locating a boundary of the guard interval (see col. 4, lines 58-60). Therefore, Keevill et al. discloses coupling the resampling circuit that is used to locate a boundary of the guard interval to the FFT window synchronization circuit. However, it should be noted that when both a principle wave directly received from a transmitter and a reflected wave received after subjected to reflection by mountains or buildings are received, it is impossible to locate the boundary unless a discrimination is clearly made as to which one of the principle wave and the reflected wave is to be synchronized. Keevill et al. does not disclose or suggest a discrimination being made between a principle wave and a reflected wave, and does not relate to the limitations in the claims of the present application. In contrast to Keevill et al., the limitations in the claims of the present application disclose an interference discrimination unit coupled with a correlation arithmetic operation unit, for detecting which peak is a less inter-symbol interference in the cross-correlation peaks obtained from the principle wave and the reflected wave, thus making it possible to synchronize with that one of the received

principle wave and reflected wave which has a less-interference-causing correlation peak. As a result, the degradation of the code error rate is suppressed. These limitations and advantages are neither disclosed nor suggested in any of the cited references.

Regarding claims 2, 6, 7, 15, 17, 19, 20, 27 and 30, Applicant submits that these claims are dependent on one of independent claims 1, 14 and 26 and, therefore, are patentable at least for the same reasons noted regarding these independent claims. For example, none of the cited references disclose or suggest the receiver further including a control state protection unit that includes a comparator and a protection value generator for generating a predetermined protection value, the comparator comparing the cross-correlation value with the predetermined protection value, so that the compensation of the sampling clock is suspended on the basis of the compared result between the cross-correlation value and the predetermined protection value.

Accordingly, Applicant submits that none of the cited references, taken alone or in any proper combination, disclose, suggest or render obvious the limitations in the combination of each of claims 1, 2, 6, 7, 14, 15, 17, 19, 20, 26, 27 and 30 of the present application. Applicant respectfully requests that these rejections be withdrawn and that these claims be allowed.

In view of the foregoing amendments and remarks, Applicant submits that claims 1, 2, 6, 7, 14, 15, 17, 19, 20, 26, 27 and 30 are now in condition for allowance. Accordingly, early allowance of such claims is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (referencing attorney docket no. 500.39117X00).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

Frederick D. Bailey
Registration No. 42,282

FDB/sdb
(703) 312-6600